For the Seventh Generation

A Report to Our Communities:
Environment, Safety, and Health
at Los Alamos National Laboratory
2001–2002, Volume 6

Cover

The background photo in the sky shows a petroglyph in a local canyon. The central photo shows Fuller Lodge at the Boys Ranch School in Los Alamos circa 1928. The school became property of the U.S. government during the Manhattan Project in the early 1940s. Fuller Lodge was the center of social and cultural events for scientists and their families during the secret project to build the atomic bomb. Now designated as part of a National Historic Preservation District, Fuller Lodge remains the cultural and social hub of the Los Alamos community. The property is owned and managed by the County of Los Alamos.

Clockwise, the inset photos show a mountain lion photographed in the Laboratory area, radiation control technicians Colleen Wilson and Michael Duran, a skink (lizard) captured in a Los Alamos canyon, and beryllium researcher Greg Day.

For the Seventh Generation

And each generation was to raise its chiefs
and to look out for the welfare of the seventh generation to come.

We were to understand the principles of living together.

We were to protect the life that surrounds us.

We were to give what we had to the elders and to the children.

What of the rights of the natural world?

Who is speaking for the waters of the earth?

Who is speaking for the trees and the forests?

Who is speaking for our children?

We must stand for these people, and the natural world
and its rights; and also for the generations to come.

Poem is based on a statement
by Oren Lyons, Iroquois,
which appears in Look to the Mountain—An
Ecology of Indigenous Education
by Gregory Cajete, Ph.D., Santa Clara Pueblo.

The indigenous people of North America lived in close harmony with their natural surroundings, shaping the natural environment to suit their needs for food and shelter. To a much greater extent than today, Native Americans were dependent on their immediate surroundings—the plants, forests, wildlife, and water—and were efficient stewards of those natural resources. They recognized the importance of long-term sustainable use of the resources available. Decisions were examined for their long-term implications, not just for the tribe's children and grandchildren, but for the seventh generation to come. This philosophy is common among the Pueblo Nations of the Southwest and is also found in the Great Law of the Iroquois Confederacy.

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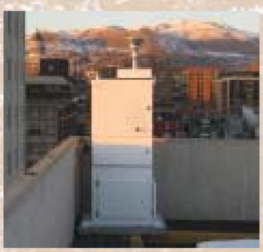


Safety and Health Articles

Welcome from the Interim Director of Los Alamos National Laboratory

I am pleased to introduce the sixth annual publication, *For the Seventh Generation: A Report to Our Communities*. The title is derived from the Great Law of the Native American Iroquois Confederacy. The philosophy of the Iroquois was to consider each major decision and action for its effect on not just the next generation, but for the seventh generation to come. Our forefathers incorporated much of the wisdom of this philosophy into the U.S. Constitution. As science and technology advance and as we wrestle with the concerns of future generations, we are wise to consider such traditional wisdom.

The first article, "A Different Country," explores the contributions of a Laboratory pioneer, Edward F. Hammel, who came to Los Alamos in 1944 and remains a local living treasure.

The section of Environmental Articles includes two environmental research articles, one about abnormalities found in lizards in the Pajarito Plateau canyons and one in which environmental scientists track bears and mountain lions. "Meanderings on The Pajarito Plateau" describes the network of hiking and biking trails throughout Los Alamos County, giving a historical overview of the area. Another article reports on the remediation of Acid Canyon, an area contaminated during the Manhattan Project that is now a recreational area owned by Los Alamos County. The final article in this section discusses rehabilitation and recovery after the Cerro Grande fire in May 2000.

Four separate articles address health and safety issues: the first, "Radiation Control Technicians: Making Decisions under Pressure," concerns training for radiation control technicians; another, "Ergonomics—The Science of Fitting the Job to the Worker," deals with enhancing worker safety, health, and productivity; the third article discusses current research on chronic beryllium disease. This section explores not only some historical concerns, but also some cutting-edge research and technology programs. The fourth article, "BASIS: Defense against Bioterrorism," focuses on a research and development project that helps safeguard against the threat of bioterrorism. This technology was used at the 2002 Winter Olympics in Salt Lake City, Utah. All articles call attention to the Laboratory employees who make Los Alamos National Laboratory a valuable resource to northern New Mexico and to the nation.

The final article, "The Value of Safety," presents current information and summarizes five years of past performance, achievements, and areas for improvement in health, safety, environment, and radiation protection.

I hope you find the articles interesting and informative. Please take a moment to send your comments on the enclosed, postage-paid response card.

Thank you,

George P. ("Pete") Nanos, Jr., Interim Laboratory Director

For almost sixty years, Los Alamos National Laboratory has been a member of the northern New Mexico community. This year's publication focuses on the theme of generations—past, present, and future—who form the backbone of this national laboratory. From our nation's wartime crisis in the 1940s to the present threat of terrorism, the Laboratory's men and women have met and overcome many challenges. In service to the nation, Laboratory employees actively seek out new ways to meet the challenges of contemporary life—both the challenges to national security and the challenges of modern health, safety, and technology.

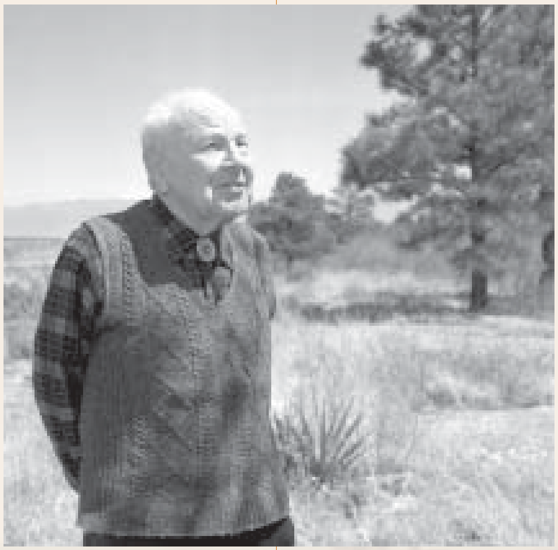
Our employees come from far and wide, but many are from local communities. Some members of our current workforce are third-generation Laboratory employees. In addition to providing a bit of historical context, most articles in *Seventh Generation* highlight people and describe some of the Laboratory's programs and projects.

A Different Country

It did not take atomic weapons to make war terrible. But the atomic bomb was the turn of the screw. It has made the prospect of future war unendurable. It has led us up those last few steps to the mountain pass; and beyond there is a different country.

J. Robert Oppenheimer, 1946[1]

We, in 2002, live in that different country envisioned by Manhattan Project and Laboratory Director J. Robert Oppenheimer—we are no longer threatened by Hitler's Nazis nor the Empire of the Rising Sun. Faced with a new century and new threats to national security, Los Alamos National Laboratory realizes its legacy has shaped the important role currently played by scientists, researchers, and other workers here on the barrancas and in the canyons of northern New Mexico. From retired Laboratory pioneers to third-generation employees, workers at the Laboratory share a common mission: to ensure national security in the United States.



The urgency of the original challenge—the dire threat of World War II—gave birth to the Laboratory and its national security mission. Wartime stress was tempered not only by the wisdom and vision of Oppenheimer, but also by the common sense and insight of other Manhattan Project pioneers. For once in U.S. history, civilian scientists determined not only the jobs to be done, but also the procedures and the priorities.

"It was horrible, but the development of atomic weapons has made world wars obsolete."
Ed Hammel

Edward F. Hammel, Jr., a chemical physicist from Dartmouth College and Princeton University and a Manhattan Project pioneer, recalls the Laboratory's early days and tells what it was like in the aftermath of Hiroshima and Nagasaki.

Of the bomb's destructive power, Ed says, "It was horrible, but the development of atomic weapons has made world wars obsolete."

Ed's job in the Manhattan Project was to understand the strange properties of plutonium—"it's such an unusual element with six different forms," he says. Plutonium, to be effective in an atomic bomb, would have to achieve a smooth compression until it suddenly went critical and set off an explosive nuclear chain

[1] *The Manhattan Project: A Secret Wartime Mission*, Ed. Kenneth M. Deitch, Discovery Enterprises, Ltd., Lowell, MA, 1995, p. 63.

reaction. Scientists had to figure out how to assemble an explosive device containing the fissile material—a daunting task.

He says, “Immediately after the war ended, we couldn’t just go home. We knew the world had changed forever and had to think of a way to communicate the drastic change that had been wrought by the bomb. We knew that people would have great hopes and fears for the new atomic technology. We formed a group, the Los Alamos Association of Scientists, to discuss these issues and to respond to the world’s questions and concerns.”

A week after the Japanese surrender, a memo circulated at the Laboratory calling for “an organization of progressive scientists.” The memo pointed out that “the future will hold more problems” and called for the organization to see that the new scientific and technological advancements would be “used in the best interests of humanity.”

The association of scientists discussed many topics, including how to manage atomic power after the end of World War II. Many scientists thought that the awesome power of atomic weapons should be placed under the auspices of an international agency, such as the United Nations, and not left to the discretion of any one world power. Surprisingly, the U.S. Congress agreed, but the Russians vetoed the idea.

World War II had clearly demonstrated the importance to national defense of a vigorous, broad-based national scientific establishment. The Atomic Energy Commission and the National Science Foundation were formed, partly in response to that need.

In October 1945, Dr. Oppenheimer accepted the Army-Navy Scroll for Excellence in the war effort and said, “I accept from you this scroll for the Los Alamos Laboratory, for the men and women whose work and whose hearts have made it. It is our hope that in years to come we may look at this scroll, and all that it signifies, with pride.”

Now, decades later, Ed says, “The Lab moves on. Focus and initiatives change, but stockpile stewardship is one of the main issues for the Lab today. The Laboratory’s challenge and mission are ensuring that the stockpile is reliable.”

The men and women of the Los Alamos Laboratory have “changed the world society,” Ed says, and they still serve the Laboratory’s national security mission.

A different country in a different world.

In the Ladies Room

Ed and Caroline in Italy during the 1970s.

In 1939, Dartmouth College provided meals only for freshmen, and other students had to fend for themselves. Enterprising folks in the area opened Eating Clubs, so upperclassmen could purchase tickets and have regular meals. Waiters ate free. One avant-garde eating club, The Rood Club, even had a room set aside where the young ladies in town could be served. Ed Hammel waited tables at The Rood and served in the Ladies Room. He was soon smitten by one Caroline Moore, whose father was president of Skidmore College in Saratoga Springs, New York.

Happily for both young people, they married in 1941 and moved to Los Alamos four years later after Ed earned a fellowship at Princeton. Ed recalls that Einstein was an "unmistakable" figure on the Princeton campus.

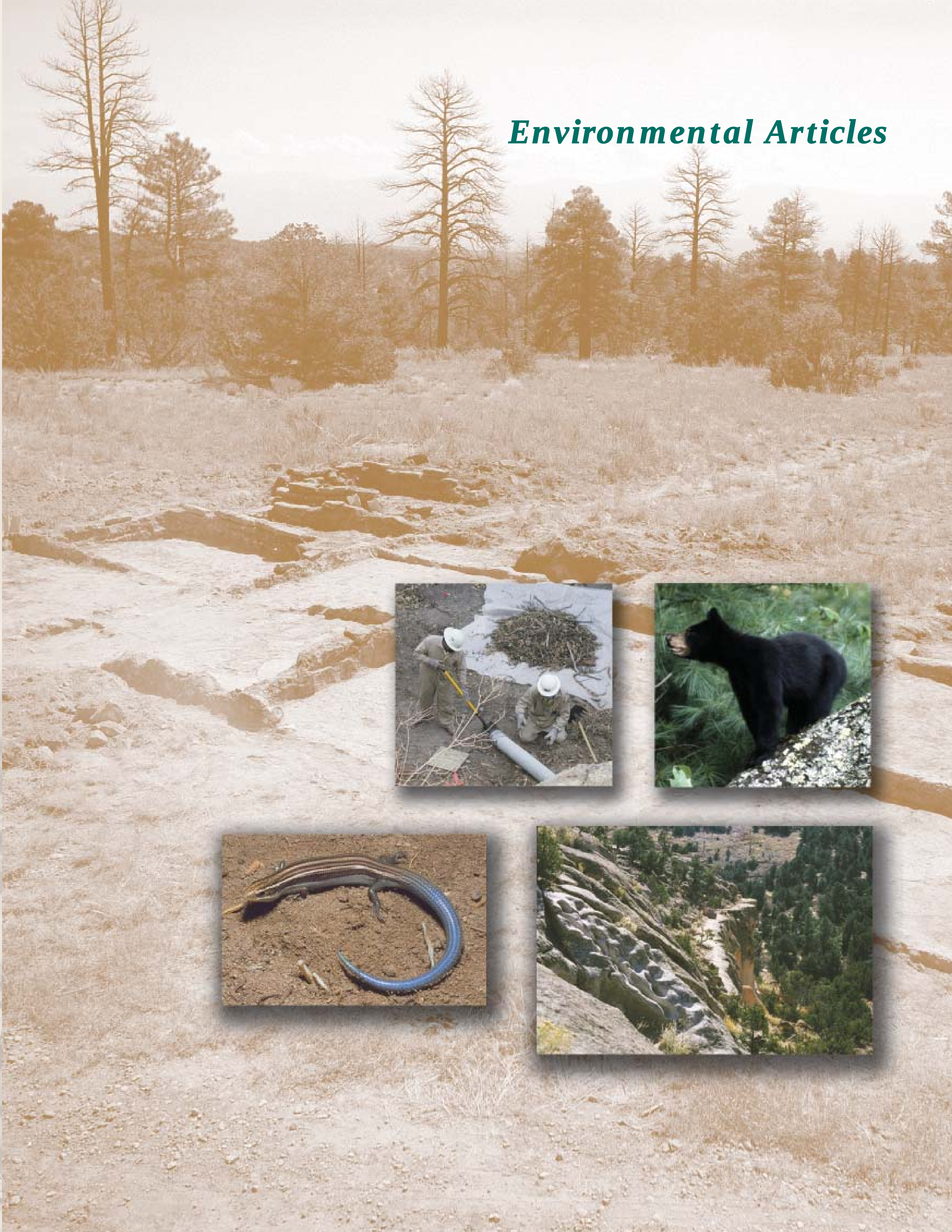
Because of Caroline's health, the couple wanted to move to the less humid west. Ed had heard rumors about a secret wartime project in remote New Mexico. Coincidentally, Caroline had visited Bandelier National Monument in 1937 and taken a photo of the Española valley and the Sangre de Cristo Mountains from what is now the Clinton P. Anderson Overlook.

The couple at their home in Los Alamos.

After requesting a transfer to Los Alamos, Ed received a telegraph from Manhattan Project director Robert Oppenheimer telling him to "go to Chicago, and then take the 'Santa Fe Chief' to Lamy, New Mexico." There, he would be met by an army driver who would take the young couple to their new home in Los Alamos.

During Ed's work on the Manhattan Project and their long married life on the Pajarito Plateau, Ed delighted in telling people he met his wife in the ladies room. Caroline, he says, "was good-humored" about his jest.

Environmental Articles



Reptile Mystery Investigated

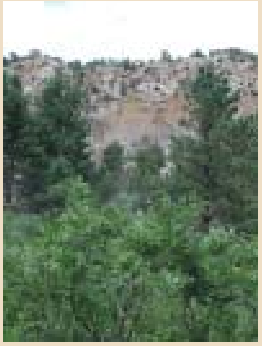
An environmental monitoring team at Los Alamos first encountered the mystery in the summer of 2000 during a study of organic biocontaminants, such as DDT and PCBs, within Los Alamos National Laboratory boundaries. Something was causing physical abnormalities to skinks (a type of lizard) in Sandia and DP canyons. Was contamination in the canyons causing problems for skinks? Or are there natural factors that would cause physical anomalies? How did skinks outside Laboratory boundaries compare?

Reptiles and amphibians have long been considered good indicators of environmental stress because they are especially sensitive to pollution and loss of habitat. Recent studies around the world have shown that exposure to ultraviolet radiation will affect limb regeneration, DNA metabolism, and chromosome formation. Other studies have found correlation of abnormalities to acid rain.

The photo above shows a skink is in the hands of a researcher.

Physical anomalies, such as missing digits, unusual color patterns, and tail malformation, are not uncommon in lizard populations. Predators, rival species, freezing temperatures, parasites, ultraviolet radiation, and disease can cause any of these. Because the skinks captured in this study were from canyons known to contain low levels of PCBs and DDT, further investigation was warranted.

In the summer of 2001, Gil Gonzales, from the Laboratory, and herpetologist Don Sias from the University of New Mexico devised a study. The purpose was to compare many-lined skinks captured in two canyons within Laboratory boundaries known to contain contaminants with many-lined skinks captured in two other canyons outside of the influence of Laboratory operations—Garcia and Chupaderos canyons on Santa Fe National Forest land. Through statistical analyses, the researchers hoped to determine whether there was a relationship between the rates of physical anomalies and location.



A group of Laboratory scientists, senior technicians, and college students employed for the summer began the study. Despite difficult working conditions in hot, dry terrain, the team set up and maintained about 250 traps in the four canyons.

Captured skinks were brought back to the laboratory for examination. Each skink was measured from snout to the base of the tail and weighed. Skink tails were measured separately. They recorded the tail length and whether the tail was the original, regenerated, freshly broken, or a nub. The team also noted whether the skink had missing claws or toe tips, missing digits, missing limb segments, missing or abnormal joints, any other physical abnormality, or unusual patterning. Researchers recorded the number of scars and whether the skink had parasites on its body.

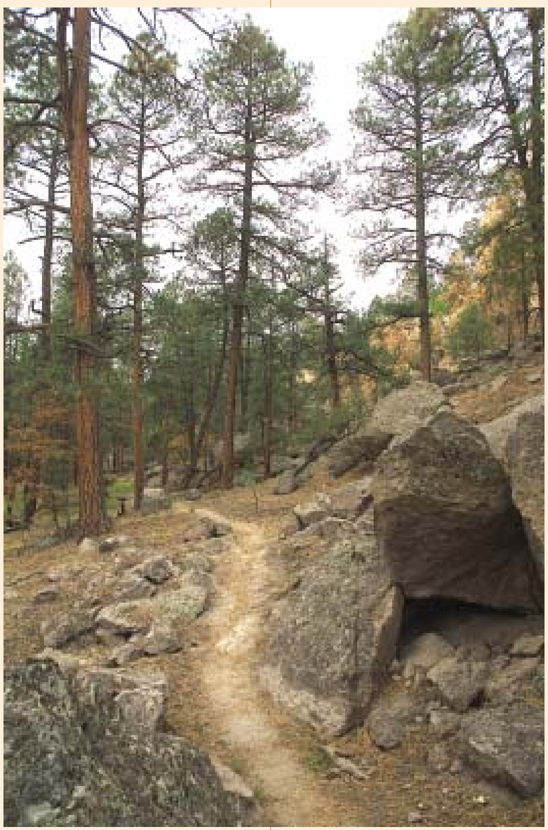
Finally, a nontoxic rubberlike dye was used to give each skink a unique color-coded identification that will enable researchers to identify a recaptured skink. This is important to assess changes that occur to skinks with age and changes in population characteristics. After examination, the skinks were returned to their original capture location and released.

Skinks belong to a family that contains about 1000 species, but only three of those species are found in New Mexico. Skinks are secretive in behavior, and their soil-burrowing nature makes them even more elusive to humans. But by the end of the summer, 377 skinks had been captured and examined—115 from Garcia and Chupaderos and 262 from DP and Sandia canyons. Garcia Canyon, a canyon outside Laboratory boundaries, had the highest frequency of physical anomalies.

Anomalies seem more related to habitat quality and population density than to contaminants. As with all comparative statistical studies, continued data gathering will provide better results. Hence, Gil and his crew spent the summer of 2002 again trapping and analyzing skinks in the same canyons. Data on these skinks do not show Laboratory contaminants at fault.

Acid Canyon Remediation 2002

During the 1940s, activities in the then-secret city of Los Alamos, just like any other city or town in the U.S., resulted in liquid wastes, both municipal and industrial. Until 1947, wastewaters in Los Alamos, like some U.S. municipalities, were still being discharged without treatment to streams and other bodies of water.



Several hiking trails pass through Acid Canyon. Los Alamos County now owns the canyon, considered by some to be one of the most beautiful areas in the county.

In Los Alamos, those wastewaters included radioactive wastes from the Manhattan Project, where scientists were working around the clock to build a bomb that could end the war. These effluents were discharged mainly into a branch of Pueblo Canyon that became known as Acid Canyon. From 1947 to 1964, the radioactive effluent was treated in the first radioactive liquid waste treatment facility at Los Alamos before being discharged to the canyon. After its shutdown in 1964, buildings and contaminated soil were removed from the liquid waste treatment facility and disposed of appropriately. Additional soil was removed from the mesa top in the late 1970s and 1980s. Since the 1960s, numerous studies conducted on sediment deposits in Acid Canyon have identified the presence of plutonium and other radionuclides in some areas of the canyon, although none of these studies have found contaminant levels in the canyon bottom high enough to require excavation.

In 1999, newer environmental characterization methods (not available in previous studies) identified higher levels of radionuclides. Although a risk assessment showed that these levels posed no unacceptable risk to the public, the presence of radionuclides in Acid Canyon was a concern. Following Department of Energy as-low-as-reasonably-achievable (ALARA) guidelines, the Laboratory, under the direction of the Department of Energy and in coordination with the New Mexico Environment Department, removed contaminated sediment in 2001 and transported it to approved disposal facilities. This project further reduced the potential radiation dose to people who use the canyon for recreation.

To minimize dust and damage to the environment, heavy machinery was not used in the steep, narrow inner canyon. Instead, workers used hand tools to remove sediment so it could be vacuumed out. The red markers pinpoint areas for the workers to remove sediment.

After soil samples were checked for radioactivity, noncontaminated vegetative debris—leaves, twigs, branches, and roots—were piled on plastic sheets for later use in restoring the canyon. Hand-held field-radiation instruments were used to define the initial areas of sediment removal and to confirm that the excavation was deep enough. Samples submitted to laboratories further confirmed that cleanup goals were met.

Workers used the vacuum system to remove pockets of contaminated sediment. Air quality was screened continuously in the work areas, and workers wore protective clothing and radiation monitors during cleanup. All monitors indicated no worker exposure to airborne particles. Crew members were checked for contamination as they exited the cleanup areas. All protective clothing was disposed of appropriately.

The cleanup crew removed contaminated sediment with hand tools and fed the sediment into a 6-inch vacuum hose, which then deposited the soil into sealed, airtight containers.

A vacuum hose transported excavated sediment out of the inner canyon. Any fine particles not deposited in the waste containers were collected in the vacuum-system baghouses and/or in-line filters. High-efficiency particulate aerosol filters prevented any release of fine particles from the vacuum machinery into the ambient air. Finally, all trucks and containers used to move the contaminated soil met federally mandated safety standards for transporting radioactive materials. Radioactivity levels in all of the waste containers were kept well below U.S. Department of Transportation standards.

Workers spread a mix of wood chips, fertilizer, and seed on the canyon floor to help restore the canyon bottom. The wood chips came from the canyon vegetation that was removed during site preparation.

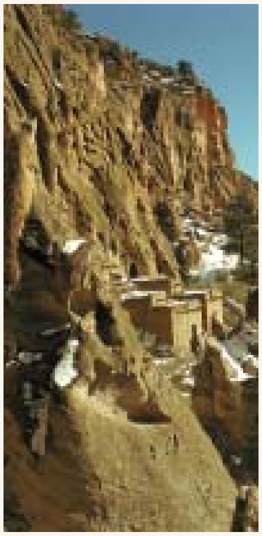
Below, jute matting spread over the canyon floor helped reduce erosion and aided revegetation.

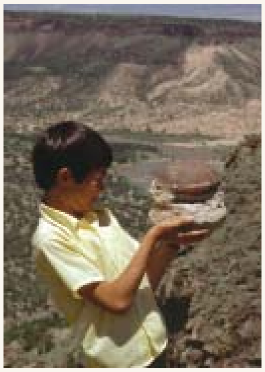
At right, Acid Canyon after remediation during the winter of 2002.

Meanderings on the Pajarito Plateau

There was a time when the only trails on the Pajarito Plateau were made by animals. Where there was water, there were trails. Animals made paths along the easiest access from the plateau into a canyon. Wildlife generally spends the least possible energy necessary to accomplish a task and will not stray from a good course to a more difficult one as humans might, simply for more challenge or fun. Keeping hunger and thirst at bay does not allow such diversion.

The Pajarito Plateau is a broad piedmont at the foot of the Jemez Mountains and the Sierra de los Valles. From the air, the mesa tops resemble outstretched fingers after thousands of years of running water draining this side of the Sierra. The running water formed deep canyons that today reach the Rio Grande in White Rock Canyon. Most, but not all, of the mesa tops are about 900 feet above the river. However, all of the canyons are deep enough to have sheer cliffs.





From White Rock Canyon, the mesa tops rise up by about 3,000 feet toward the Sierra then gain about another 3,000 feet elevation to the top of Pajarito Mountain approximately 12 miles away. From the river at the canyon bottom to the top of Pajarito Mountain, the elevation change creates four vegetation zones, and the topography of the canyons creates microhabitats. All of this variety and the various natural springs across the plateau provide an environment friendly to people.

The first known humans who ventured onto the plateau in 9500 BC were nomadic hunters who followed the paths already established by game animals. As time passed, the nomads, drawn by the rich natural resources in the area, adopted a more sedentary lifestyle.

The soft tuff rock composing the cliff faces of the canyons contained numerous caves that could be used for shelter. Caves were often enlarged and enhanced with rock walls around the openings. As populations grew, people began to gather into larger settlements called pueblos. By AD 1200, a fairly large population of Native Americans inhabited pueblos on the plateau. They

created other trails that connected to neighboring pueblos, or led to a spring or the river, or that switched back and forth up the steep side of a canyon to the mesa tops. Even to this day, there are at least four trails that lead from the bottom of the Bayo Canyon complex where ancient pueblos once stood. That these trails remain from centuries past is certain, for in many places footsteps have carved passageways deep into rock, and footholds provide access to upper shelves.

In the 1500s, drought forced the people of the Pajarito Plateau to move closer to the river; however, they continued to use resources on the plateau and in the mountains. By the late 1800s, Europeans and Hispanics were also using the rich grazing lands and timberlands. Some of them reached the mesa tops by way of *el Camino de la Culebra*, which today is the main highway to the Los Alamos Laboratory and community—it's not clear whether this road was so named because it winds around the side of the mesa like a snake or if somebody killed a snake while traveling on it. Other settlers may have used the Pajarito Trail, which at one time connected Española to Jemez Springs.

Top, footsteps carved deep into rock and footholes provide access to upper shelves on the canyon face. Center, the original *Camino de la Culebra* became a wagon trail and later the two-lane highway that leads to Los Alamos.

The Swiss-American scholar Adolph Bandelier first encountered the ancient pueblo ruins in Frijoles Canyon by following his guides down a trail. He explored between 1880 and 1886 and became completely familiar with the area by using the established network of paths and trails. At the turn of the 20th century, the Homestead Act motivated settlers, primarily Hispanic, to move onto the plateau, and homesteads were established all over. There was once even a dude ranch in Pajarito Canyon! With settlement came more trails. One is the Camp Hamilton Trail, which was built by the boys of the Los Alamos Ranch School in the early 1900s so they could ride their horses down to Coomer's old cabin in Pueblo Canyon. This trail and the ones in Frijoles Canyon can still be walked on today.

Over the centuries most of the trails do not last. If not used, they blend back into the natural habitat. Today, residents, visitors, hikers, and mountain bikers enjoy a far-reaching network of trails throughout the area, suggesting that the favorite trails will not fade away.

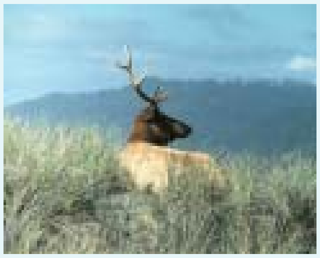
Lions and Tigers and Bears, oh my!

"Lions and tigers and bears, oh my! Lions and tigers and bears, oh my!" cried Dorothy and her traveling companions in *The Wizard of Oz* as they looked with concern at the yellow brick road winding into the deep, dark wood. Earlier, when Dorothy's house had flown to the Land of Oz in a Kansas tornado, she said to her dog, Toto, "I have a feeling we're not in Kansas anymore."

Well, the woods of the Pajarito Plateau are definitely not Kansas, the year is not 1939, and unlike Dorothy, Laboratory researcher James Biggs, actually looks for mountain lions and bears. James oversees several of the many wildlife studies currently underway at the Laboratory. Some Laboratory studies are in conjunction with other agencies in the area that also manage wildlife, such as the National Park Service at Bandelier, the U.S. Forest Service, the New Mexico Department of Game and Fish, and neighboring Pueblos. Some projects stem directly from studying the effects of the Cerro Grande fire in 2000. Other studies develop and assess tools recently made available by modern technology, such as genetic analysis and satellite telemetry. All studies provide data to develop a biological resources management plan for the approximately 40-square-mile Laboratory.

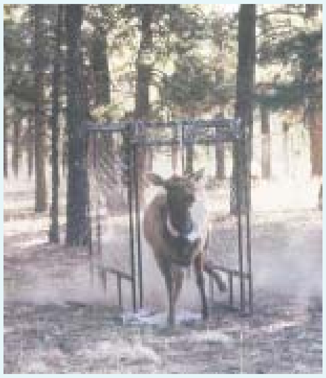
James oversees development of the management plan, and one particular study involves mountain lions and black bears. (There are no tigers here, unless you consider the tiger salamander or the tiger swallowtail butterfly.) Researchers want to track mountain lion and bear movements by fitting these animals with radio collars that send signals to satellites in space, which, in turn, store location data in the collars. Researchers have successfully tracked elk and deer using the technology here on the Pajarito Plateau. However, the lions and bears are not easy to capture.

To accomplish the goal, genetic analysis will be developed and tested. Capture crews will take blood and saliva from captured animals, and field crews will develop methods for collecting scat and hair samples. The field crews will investigate those areas frequented by deer and elk.



Because elk and deer are the main source of prey for lions, researchers know that lions will be in those same areas. The crews want to find and collect scat samples; and various types of snares will be strategically placed to collect hair samples. The blood, saliva, scat, and hair will be frozen for future DNA cataloging.

Because of the Cerro Grande fire in May 2000, distribution and behavior of mountain lions and bears will change over the next several years, depending on the recovery of natural vegetation. Much of the forest was moderately or severely burned, forever altering the habitat. Where dense stands of ponderosa forest once stood, now shrubs, grass, and aspen will grow—a habitat that is favored by deer, elk, and many other wildlife species. Over the years, vegetation will continue to recover and redefine the vegetation zones on the plateau. There will be more open meadows than before the fire. As a result, elk and deer (and lions and bears) will occupy portions of the plateau that were not previously attractive to them.



As wildlife move into new areas, chances of human encounters increase. Questions and concerns arise: for example, will certain roadways have more frequent elk and deer crossings, increasing chances for vehicular accidents? The health and safety of both animals and humans are directly affected and a primary concern to these researchers. The data they collect will provide information related to wildlife distribution, movement, behavior, and population size. The telemetry work will tie into other research related to vegetation recovery and foraging preferences of elk and deer. All this information can be used to implement biological resources management strategies to help ensure a safer environment.

Cerro Grande Fire: Rehabilitation and Recovery

Rehabilitation

In May 2000, the Cerro Grande fire burned thousands of forest acres on and around Los Alamos National Laboratory. Immediately after the fire, increased erosion, flooding, and the potential impacts from contaminated soil and sediment raised concerns. Within the floodplain area, 77 potential contaminant release sites and 2 nuclear facilities that contain hazardous and radioactively contaminated soils and materials were identified.

Workers place straw wattles to prevent erosion and runoff. Straw wattles are 9-in. by 25-ft rolls of rice straw placed on hillside slopes. Wattles form terraces that prevent slope erosion and facilitate plant growth.

Without Department of Energy action, these potential release sites and nuclear facilities—called rehabilitation units—could possibly have released contaminants during rainfall runoff. Also, many cultural resource sites and traditional cultural properties in canyons or along drainage area were at increased risk of flood damage and damage from falling or uprooting burned trees.

The Laboratory implemented an Emergency Rehabilitation Plan to evaluate the impact of the Cerro Grande fire, mitigate erosion and rainfall runoff, and prevent further damage to people, property, and the environment.

The Laboratory launched two initiatives as part of this plan. The Emergency Rehabilitation Team carried out emergency actions to recover from the fire. The Cerro Grande Rehabilitation Project addressed near- and long-term activities required to fully recover from the Cerro Grande fire.

The Laboratory assessed damage and initiated on-the-ground rehabilitation efforts, including hydromulching, hand seeding, contour raking, straw mulching, placing straw wattles, and building log and rock check-dams.

Rehabilitation treatments include hydromulching, hand seeding, contour raking, straw mulching, placing straw wattles, and building log and rock check-dams. Photo below shows vegetation cover one year after treatment. The area in the background was treated and the area in the foreground was not.

Under the Department of Energy Special Environmental Analysis, the Laboratory monitored the burned areas and rehabilitation units. In all, the Lab treated over 1800 acres. The project succeeded, increasing vegetative cover on the severely burned rehabilitation units from around 0% to almost 45%. Most of the straw wattles have held sediment in place and allowed vegetation to grow. Out of 40 rehabilitation units, only 5 require additional work.

Rehabilitation Unit 11 shows vegetation cover before and after rehabilitation treatment .

Recovery

Laboratory psychologist Tom Locke says that employees have recovered well from the impact of the Cerro Grande fire. No longer critical or significant for the majority of people, the 2000 fire and its aftermath have become a part of our lives, and "we have woven it into how we live our lives. The fire is an element of our community, but no longer the primary focus. However, memories still come up and evoke feelings of sadness, anger, and a sense of being overwhelmed."

The fire verified our vulnerability, and along with the events of September 11, 2001, Tom says, "left us with a heightened awareness and a more realistic sense that we don't have control. We are going to have reactions from time to time to anything that reminds us of our increased vulnerability, and we'll react to these things differently. It is not a cause for alarm."

"We've all learned important things about how we respond to crisis—about what we have inside."
Tom Locke, Laboratory psychologist

One family who lost their home in the Cerro Grande fire shared some of what they learned during the recovery process. While all their material belongings were lost, some new insights and relationships developed for Mike and Ivy Barnes. "We're family now," says Mike of the Ramsey family who opened their home after the Barnes' home was destroyed by the fire.

The Ramseys and their children welcomed Mike and Ivy and were delighted to help. Mike and Ivy also express appreciation to the New Mexico congressional delegation and for the local community support for their assistance after the fire.

Mike and Ivy helped the Ramsey children celebrate a birthday.

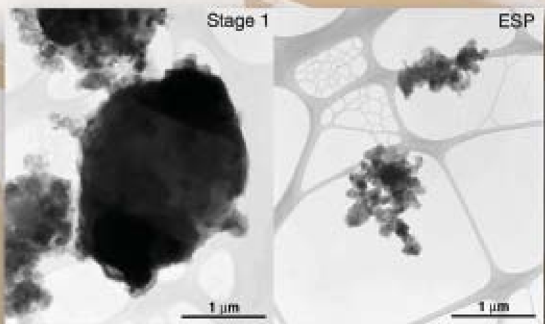
A year after the fire, Mike and Ivy moved into a new home in Santa Fe. The new home sparked their creative juices—Ivy has "found a new facet" of her personality with home decorating, and Mike has taken photography classes at Santa Fe Community College. The couple now plans to add a photo studio to their home.

Mike and Ivy at their burned homesite shortly after the fire.

Mike and Ivy regard the Cerro Grande fire experience as an opportunity for emotional and spiritual growth. Ivy says, "The fire strengthened our relationship. We found out that we have more courage, tenacity, and strength at the core than we knew."

Mike and Ivy at their new home.

Safety and Health Articles



Radiation Control Technicians: Making Decisions under Pressure

Radiation control technicians, called RCTs, help ensure that people and the environment are protected from exposure to radiation or radioactive materials. They must make correct decisions under pressure—people's health and safety may depend on it.

RCTs survey, monitor, and respond to radiation concerns, including radiation abnormalities and emergencies at the Laboratory. These workers are critical to Laboratory facilities that use radioactive materials and machines that produce radiation.

Above and at right, RCTs go about their daily duties at the Laboratory.

An RCT has many duties and responsibilities that require a well-qualified and trained professional. In a typical work day, an RCT may

- work with a variety of people from scientific researchers to managers and crafts workers;
- evaluate and help direct work in radiological controlled areas;
- designate radiological controls for safe work practices;
- perform area surveys to evaluate radiological conditions; and
- respond to emergency and abnormal conditions dealing with radiation.

Northern New Mexico Community College in Española, New Mexico, is home to a RCT training program that prepares many of the Laboratory's radiation control technicians for their work. The community college offers a two-year program that leads to an associate of applied science degree in radiation protection. The Laboratory recently started offering summer undergraduate RCT internships for interested students.

Colleen Wilson, an undergraduate student intern from the training program, worked with Michael Duran at Los Alamos during the summer 2002. Colleen decided to enter the training program because she enjoys radiation-protection work and hopes to become a Laboratory employee.

Colleen became interested in radiation protection after working as an x-ray technician. She pursued her interest by enrolling in the community college training program. She finds that much of her x-ray technician background helped prepare her for the present course of study to become an RCT.

What do radiation protection professionals do?

Colleen assists Laboratory RCTs with surveys and health physics duties. As a student, she has flexibility and variety in her daily duties. There is a moderate amount of physical work involved—she may carry radiation-detection equipment while wearing personal protective equipment, which may consist of two pairs of coveralls and a respirator, or even self-contained breathing apparatus.

What training does a radiation professional receive?

Comprehensive examinations, written and oral, are given at the end of training before the student candidate becomes qualified by the Department of Energy. Then, the RCT must requalify every two years. Professional development can continue with the National Registry of Radiation Protection Technologist examination and the American Board of Health Physics certification examination after seven years of professional experience.

Colleen's mentor, Michael Duran, is a Laboratory radiation-protection professional. Mike comes from a family of educators and earned his bachelor of science degree in physics at Fort Lewis College in Colorado and a master of science in health physics from Colorado State University. Regarding his Laboratory career, Mike says, "I started out as a graduate research assistant and was encouraged by the opportunities through mentorship.

"I have taught radiation-protection classes for more than eight years now, mainly in the evenings at the Northern New Mexico Community College campus in Española."

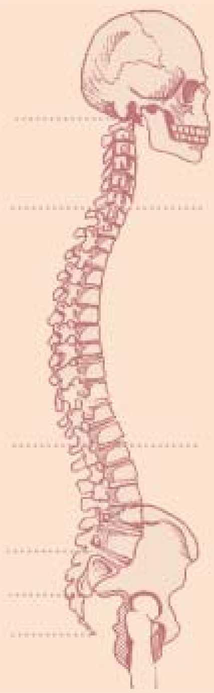
Mike's enthusiasm about the RCT training program shows: "I like the satisfaction of seeing students gain knowledge that leads to a good outcome. Students who go through the training program are prepared to successfully compete and obtain jobs as radiation control technicians at the Laboratory. Most students in the program are from the surrounding communities, and they are people who are likely to stay at the Laboratory."

Mike says, "The radiation protection degree program at Northern New Mexico Community College takes effort, but it is a Laboratory investment in training that benefits students and the Laboratory. There are always opportunities."

Micheal Duran demonstrates the survey and monitoring process to intern Colleen Wilson.

RCTs wear personal protective equipment to perform their duties.

Ergonomics—The Science of Fitting the Job to the Worker



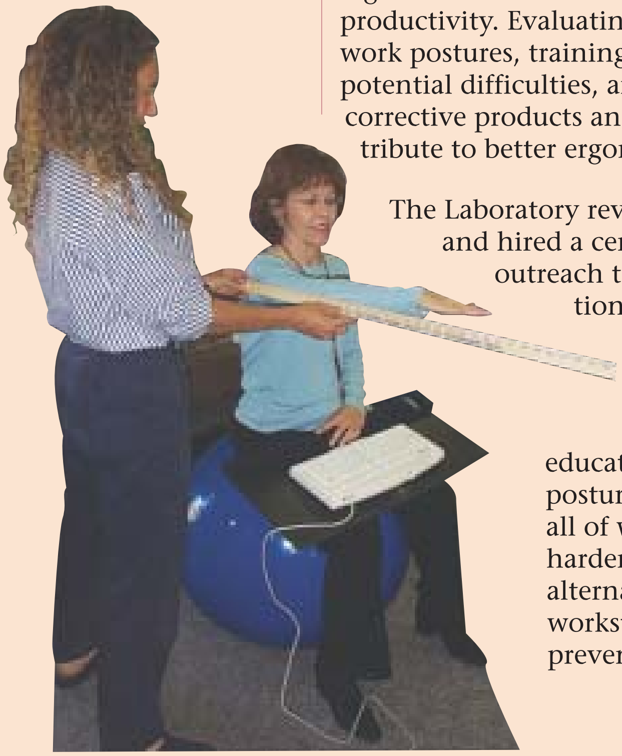
Fitting the job to the worker means minimizing worker fatigue and discomfort and enhancing worker safety, health, and productivity. Ergonomics topics range from work-related issues, such as well configured computer workstations and safe lifting practices, to leisure activities, such as healthy gardening, driving, and bicycling.

Ergonomics covers many aspects of a job, such as the following:

- physical factors such as stresses placed on joints, muscles, nerves, and tendons;
- environmental factors that may affect hearing and vision;
- engineering factors such as workstations and tools; and
- other factors such as temperature and vibration.

From the work bench to the garden, the latest in ergonomic tools drew a crowd at a recent exposition. The expo also featured booths on ergonomic office furniture, a model computer workstation, and an occupational medicine information center. Above, participants visit with ergonomics program manager Graciela Perez.

The Laboratory's ergonomics program benefits worker health and safety—good ergonomics maximizes worker safety and productivity. Evaluating workstations and work postures, training workers to detect potential difficulties, and intervening with corrective products and practices all contribute to better ergonomics.



The Laboratory revved up its ergonomics program in 2001 and hired a certified professional ergonomist to increase outreach to workers. Outreach includes presentations, expositions—at least four times a year—and onsite ergonomics analyses.

Now, Laboratory employees can get professional advice, workstation evaluations, education about equipment, and training in safe postures and equipment use in the workplace—all of which help people work smarter, not harder. For example, changing postures and alternating different tasks at a computer workstation can alleviate discomfort and prevent repetitive motion injuries.

Ergonomics teaches Laboratory workers how to use correct postures for lifting.

The ergonomics program is a vital part of health and safety practices for Laboratory employees. Repetitive motion, awkward postures, and/or forceful exertions, such as twists while lifting, are the culprits in most workplace injuries and illnesses. Fortunately, very few of these injuries now require more than first-aid treatment, primarily because of early detection, intervention, and employee training.

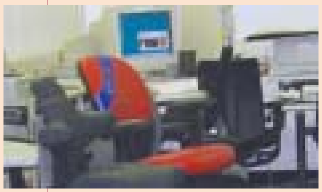
All employees are encouraged to report signs and symptoms of ergonomic problems immediately so that corrective action may be taken as quickly as possible. As an important step in the process, injuries and illness reported to the Laboratory's occupational medicine office are analyzed to reduce and, wherever possible, to eliminate risk factors in the workplace.

Employees can request an ergonomic analysis of their work environments by an ergonomics specialist. New building construction and the introduction of new technology at the Laboratory now incorporate ergonomics at the initial design stage. Also, workers have access to a board-certified professional ergonomist and trained ergonomics specialists.

At an ergonomics expo, Nancy Teague, right, and Mary Miller, are all ears as James Barber, left, explains how biofeedback can help reduce stress and improve overall health.

For assistance, employees can visit an interactive ergonomics website or go in person to the ergonomics demonstration room and resource center. The website has several ergonomics tools available for employees, including a self-assessment checklist to help determine if their workstation is properly designed for their particular work and tasks.

Work smarter, not harder is the proactive motto of the ergonomics program. The program helps prevent injury and illness and encourages worker health and safety.



In the ergonomics demonstration room and resource center, vendors and ergonomics experts provide training on various products and specific topics. Trained ergonomics specialists provide information on office equipment including chairs, computer input devices, keyboard trays, and document holders. Visitors to the center can test computer devices, chairs, and a variety of other products.

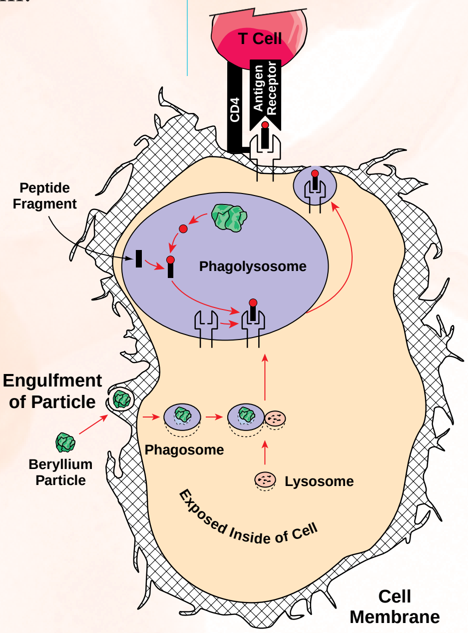
Understanding Chronic Beryllium Disease

Beryllium (chemical element Be) is most often used in combination with other elements and metals. For example, beryllium compounds and alloys are used in microelectronics, brakes for aircraft, and structural elements for the space shuttle. In some individuals, long-term exposure to beryllium provokes chronic beryllium disease, a serious illness with lung-damaging effects similar to tuberculosis. The disease occurrence in beryllium workers has prompted regulations for safeguarding those workers. Nonetheless, the disease remains a concern, the safeguards having diminished but not eliminated its incidence. Ongoing research seeks to better understand the important chemical and biological factors that lead to the disease.

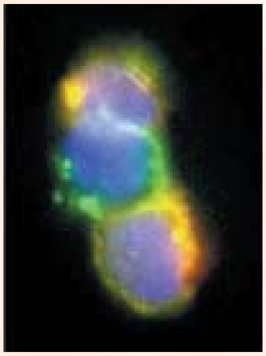
Above, researcher Greg Day working in a glovebox.

Beryllium is believed to enter the lungs as tiny inhaled particles of “dust” from operations such as machining, and the particles can activate certain T cells—a type of lymphocyte, a white blood cell found in the lymphoid tissues—of the immune system. Some evidence indicates that beryllium can also activate these T cells by skin exposure, and previous Laboratory research indicates that an individual’s genetic background may be a factor. With chronic exposure, the activated T cells—similar to cells damaged by the AIDS virus—release chemical signals (cytokines) to summon other white blood cells (called monocyte-macrophages) into the lung, to help wall off and eliminate beryllium.

Below, a beryllium particle is processed after entering a cell membrane, which triggers the activation of a T cell. Blocking this early step might prevent disease.



As long as ten years after exposure to beryllium, the macrophages—ameboid cells that engulf foreign material— can form tissue structures known as granulomas (lesions of inflammatory tissue) that disrupt lung architecture and lead to disease. So determining what chemical form of beryllium—particulate or dissolved—first stimulates T cells may be a key to preventing the disease. An important unanswered question involves identifying the chemical type of beryllium to which the body responds, and Ronald Scripsick and his colleagues at the Laboratory are conducting research to find an answer.

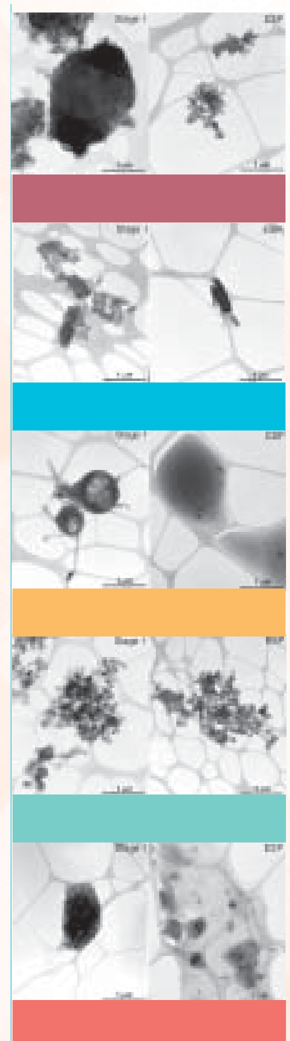


Three blood T cells fluoresce under the microscope after treatment with an identifying biochemical tag.

Using methods developed in part by graduate students Greg Day and Aleks Stefaniak, the researchers use cultured (cells grown outside the body) macrophages to study the factors that influence the formation of dissolved forms of beryllium, both inside and outside the cells. Dissolution is likely to be important in the initial stages of T-cell activation, a step known as “antigen presentation.” To effectively measure important parameters, Greg and Aleks have refined a variety of techniques, including modifying methods for growing the macrophages and precisely dosing them with beryllium. They also investigated novel approaches to separate particulate and dissolved beryllium.

Preliminary results suggest a two-stage dissolving process for beryllium oxide. They also indicate that for relatively insoluble forms like the oxide, the stimulation of T cells may be closely tied to the characteristics of dissolution. Because previous research has suggested that beryllium oxide (rather than more soluble forms of beryllium) may be the key chemical in disease initiation, such findings promise to be important to the actual disease process in workers exposed to beryllium.

The beryllium research project is an ongoing part of beryllium operations at Los Alamos. Beryllium technologies are a part of national defense activities, and the Lab’s new beryllium technology facility is state-of-the-art. The Laboratory—together with industrial and healthcare partners—sponsors a number of research studies. The research findings have the potential to help researchers understand the first step in triggering chronic beryllium disease and ultimately to develop methods for intervention. For example, the right drug—inhaled into the lungs to block the activating effect of beryllium on T cells—could halt the pathological course of chronic beryllium disease before it ever gets the chance to damage lungs.



Pathological changes in the air sacs (alveoli) of the lungs in stage-one chronic beryllium disease, showing different samples of infiltration by macrophage-like cells with disruption of normal lung architecture.

Graduate students Greg Day and Aleks Stefaniak conducted much of the research for this project, guided by Laboratory scientist Ronald Scripsick, director of the beryllium research project.

Greg (top) based his doctoral dissertation on this project. Greg worked at the Laboratory for three years before completing his Ph.D. in industrial hygiene from the University of Oklahoma Health Sciences Center in 2002. He accepted a position with the Centers for Disease Control and Prevention and moved to West Virginia during the summer of 2002.

Bottom, Aleks (seated) and project director Ron Scripsick. Aleks has worked with the beryllium research project for three years and will complete his Ph.D. in environmental health science at Johns Hopkins University School of Public Health in June 2003. Aleks plans a career in occupational health research at an academic or government research institution.

For more information on this research, refer to Technology Development, Evaluation, and Application, TDEA FY 2000 Progress Report. LA-13901-PR pp. 63 and 64 at http://lib-www.lanl.gov/cgi-bin/getfile?00818909.pdf. Copies are also available for sale to the public from: National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22616, (800) 553-6847.

BASIS: Defense against Bioterrorism

When the 2002 Winter Olympics opened in Salt Lake City, technology developed by Los Alamos and Livermore National Laboratories was monitoring the Olympic park and the city for airborne biological agents. Scientists at the two national laboratories collaborated to develop the Biological Aerosol Sentry and Information System—or BASIS.

Researchers have worked since 1999 to develop a rapid detection system that could identify airborne pathogens. Los Alamos scientists developed the system's aerosol collection units, the command and control software, and sample handling procedures. Livermore scientists were responsible for the system's biodetection equipment, DNA analysis procedures, and communications capability. This collaboration built on years of biological sciences research and development at both laboratories, including related work on the Human Genome Project.

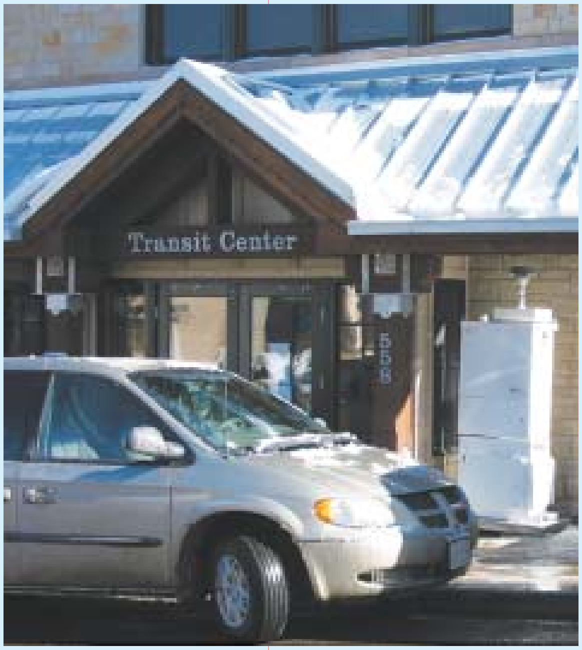
Versatile in capability, BASIS functions well indoors and outdoors. BASIS monitors air at large-scale events, such as political conventions and sporting events, but also is effective at smaller public events, such as ceremonial visits from political or high-profile dignitaries.

One BASIS unit was placed inside the Delta Center, which housed the Olympic figure skating arena.

BASIS is a network of sampling units much like those the U.S. Environmental Protection Agency uses to monitor air quality. Filters inside the units capture aerosol particles. The filters are replaced every four hours and taken to transportable field laboratories for DNA analysis. Updates on air quality are produced several times a day.

The BASIS system can be deployed quickly and is operated in association with local, state, and federal law enforcement officials to maximize protection of the public and the environment. Because BASIS reduces the detection time for airborne biological agents to less than a day, public health officials can respond quickly to an airborne bioterrorist attack. Early detection and rapid response can do much to mitigate the effects of such an attack.

Only about 6 ft tall and 3 ft wide, the BASIS units can be transported easily to diverse locations, such as on top of a parking structure (opposite page) or at a street median (above).



A BASIS unit stood sentry at the Park City train station where spectators departed for the Olympic park.

During preparations for the Olympic games, the National Nuclear Security Administration officials and researchers at Los Alamos and Lawrence Livermore worked closely with Utah Department of Health officials and the Olympic Public Safety Command to determine the best air-sampling locations and to coordinate placement of the field laboratories.

Although the system was developed primarily for security at special events that are planned well in advance, the system is designed for rapid deployment in response to intelligence warnings or crisis situations. In fact, BASIS can be packaged and placed on military air cargo pallets in less than six hours, ready to go anywhere.

BASIS is an important contribution to national security because it can provide real-time monitoring of a biological attack and timely identification of both the occurrence and the pathogen. It also significantly enhances standard monitoring capabilities because the design allows integration of future technologies. This open system architecture ensures the development of a robust, up-to-date monitoring system that keeps pace with advances in biological monitoring technologies.

Building-size posters, like the speed skating event above, were displayed on several buildings in Salt Lake City.

A. Each sampling unit contains two tubes. At the beginning of the monitoring cycle, the tube on the left has four clean filters.

B. Couriers replenished aerosol collection filters in the units every four hours.

During the monitoring process, a clean filter from the left (see photo A) automatically moves to a position between the two tubes, where it is exposed to the ambient air. After an hour of exposure, the filter automatically moves to the empty tube on the right. After four hours, all four filters are in the right-hand position, ready for pickup. Couriers remove the full right-hand tube, move the now-empty (left) tube to the right-hand position ready to accept the next batch of exposed filters, and insert a new tube containing four clean filters into the left-hand position (B). After the tubes are returned to the field laboratory, they are logged into the system's database. A bar code on each tube tracks the unit's location, time of collection, and courier identification (C), and a technician prepares samples for DNA analysis (D).

C. An identification bar code was placed on each tube.

D. A technician prepares samples for DNA analysis. He sits in front of a biological safety hood.

Performance and Progress: The Value of Safety

"I want the best safety record in the world."

G. Pete Nanos, Jr.

The Laboratory receives a grade ranging from Outstanding to Unsatisfactory for each measure. On the following pages, each grade is explained beneath its gauge noting areas of achievement and areas for improvement. Out of a possible score of 100, the performance measure gradients are:

- Outstanding 90–100
- Excellent 80–89
- Good 70–79
- Marginal 60–69
- Unsatisfactory 50–59

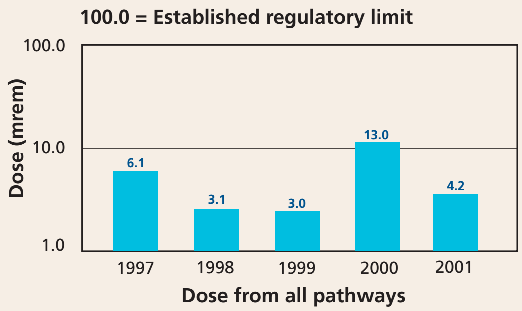
A gauge like the one above shows the overall grade for each performance measure. All targets aim for Outstanding.

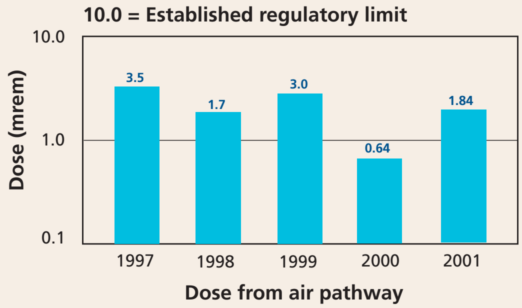
We provide charts that show four-year trends for self-assessment findings on Radiation Protection of the Public, information on Radiation Protection of Workers, Environmental Performance, and Injury and Illness categories. Discussion of targets and actual performance is included.

In 1996, the Laboratory implemented an integrated safety management system to improve safety performance and to make safety a prerequisite for all work conducted on Laboratory premises. The safety policy means we never sacrifice safety to deliver on our programmatic or scientific tasks. The term "integrated" means that the safety and environmental management system is a normal and natural element of our work. Earlier, in 1992, the Department of Energy and the University of California established a series of performance goals to measure safety improvements at the Laboratory.

These goals, called performance measures, are part of the university's contract with the U.S. Department of Energy to manage the Laboratory. Performance measures are recorded in Appendix F of the university contract, but Appendix F is not a part of this report. Performance measures change from time to time, depending on areas that require special monitoring or improvement. We furnish a summary of the past year's performance measures related to environment, safety, and health.

In self-assessment findings, the Laboratory achieved the performance goals in most categories. After conducting its self-assessment, the Laboratory submitted the findings to the University of California and the Department of Energy, which then evaluated each Laboratory performance goal and gave an overall rating. Those ratings, shown on the next three pages, indicate how well the integrated safety system operates and point out the areas for improvement.





Radiation Protection of the Public is no longer a contract performance measure and does not receive a rating from the Department of Energy or the University of California. However, the Laboratory continues self-assessment monitoring to meet Department of Energy and Environmental Protection Agency guidelines and regulations. Results are shown at left.

What is a Roentgen equivalent man (rem)?

The rem is the most commonly used unit for measuring radiation dose equivalence in humans. The rem takes into account the ionizing radiation energy absorbed (dose) and the biological effect on the body (quality factor) resulting from the different types of radiation.

mrem = 1/1000 rem

Radiation Protection of Workers

The Laboratory monitors radiation doses from occupational exposure to radiation.

Overall, the University of California rated the Laboratory Excellent and the Department of Energy gave a rating of Good. However, individual target scores varied. This year, a new metric for contamination control was evaluated.

Target 1 – Routine occupational radiation exposures are monitored to ensure that individual doses do not exceed specific limits.

Performance – Based on external plus tritium-internal doses and assessed internal doses for 2001, no employee exceeded either the dose target of 2 rem or the lifetime limit.* The Laboratory's performance on this target was rated Outstanding by the University of California and Good by the Department of Energy.

Target 2 – Occupational internal exposures caused by operational incidents and intakes of radioactive material are carefully monitored. Operational incidents are accidental releases from containment systems in which an amount of material is released and taken into the body. The target goal is no accidental intakes.

Performance – In March 2000, an incident at the plutonium facility resulted in three workers receiving intakes greater than 2 rem. A plan was developed to improve the process for analyzing incidents, identifying causal factors, and sharing lessons learned. In 2001, no worker received an intake greater than 2 rem. Performance on this target was rated as Good.

Target 3 – Improve performance in the area of contamination control by the analysis of causes, contributing factors, and mitigation and improvement opportunities.

Performance – In 2001, the Laboratory implemented an improved data gathering process, including a new remedial investigation report-sorting system, a logic diagram and guidance for report sorting, and an online remedial investigation report form. Performance on this target was Good.

*The lifetime limit is calculated at 1 rem per year of age. For example, a 30-year-old has a lifetime limit of 30 rem for that year, and a 60-year-old's lifetime limit is 60 rem for that year. See rem definition in the box on the left.

Nonnuclear Authorization Basis

The Laboratory received a rating of Outstanding from the University of California and Good from the Department of Energy.

Definition – The purpose of the nonnuclear authorization-basis safety performance measure is to monitor regulations for facilities that have potential, but not nuclear, hazards; for example, a compressed gas facility or a chemical operations facility.

Target – Redevelop the nonnuclear authorization basis across nonnuclear facilities, identify and develop milestones for all nonnuclear facilities requiring authorization, including interim authorization basis, and develop a quarterly review process.

Performance – The University of California rated the Laboratory 97 out of a possible 100 points on this measure and commended the Laboratory for implementing a systematic approach to authorization of nonnuclear facilities.

Note: Each performance measure has specific regulations that guide reporting and ratings. For example, some measures report on a calendar-year basis and others on a fiscal-year basis.

Injury and Illness

The Laboratory received a rating of Outstanding from the University of California and Excellent from the Department of Energy.

During 1994–1996, five accidents prompted official improvements to eliminate on-the-job injury and illness. In 1996, the Laboratory established a series of five-year targets to decrease work-related recordable injuries and illness and lost workdays. By 2001, the Laboratory had reduced injury and illness lower than the target goals.

Target 1– A 59% reduction for total recordable injuries and illnesses compared with the 1996 baseline.

Performance – A 63% reduction: from 532 people in 1996, the baseline year, to 193 cases in 2000 and 195 cases in 2001. The number of incidents remained essentially the same for 2000 and 2001.

Target 2 – A 74% reduction for total lost workday cases relative to the 1996 baseline.

Performance – The Laboratory's total lost workday injuries and occupational illnesses remained essentially the same with 91cases in 2001 compared to 95 cases in 2000, and 258 fewer cases than the 349 cases in 1996. This represents a 74% reduction from the 349 cases in the 1996 baseline.

Environmental Performance

Overall, the Laboratory received a rating of Outstanding from both the University of California and the Department of Energy for fiscal year 2001 and Excellent for fiscal year 2002.

Target 1 – No violations of the Resource Conservation and Recovery Act.

Performance – Self-assessment findings for the Laboratory rose to 7%, a slight increase over the previous year.

Target 2 – No exceedances of the National Pollutant Discharge Elimination System.

Performance – Three exceedances were recorded during 2001, as compared with two during the previous performance year. There were zero exceedances at the radioactive liquid waste treatment facility.

Target 3 – No violation of other environmental laws and regulations.

Performance – No violations were recorded for the Toxic Substances Control Act, the Solid Waste Disposal Act, the Clean Air Act, underground storage tank regulations, or the National Environmental Policy Act.

Management of Nuclear Facilities

The Laboratory operates its nuclear facilities according to Department of Energy requirements.

The overall performance on this metric was rated Excellent by the University of California and the Department of Energy.

Target 1 – Facility changes procedures will be developed and personnel will be trained.

Performance – All procedures were developed and all personnel were trained. Performance is rated Outstanding.

Target 2 – There are no violations of operating requirements. However, formal lessons-learned meetings can offset violations.

Performance – There were six violations of procedures. All were offset by formal lessons-learned meetings. Performance is rated Outstanding.

Target 3 – Safety documentation for specific nuclear facilities will be completed on schedule and guidance documents prepared.

Performance – The Department of Energy rated performance for this target Unsatisfactory because two documentation Safety Analysis/ Appraisal Reports missed completion deadlines.

Waste Minimization

The Department of Energy determines this target and applies it to all operating DOE sites across the country.

Target – The Laboratory will decrease or maintain routine solid low-level waste, mixed low-level waste, and hazardous waste generation at the fiscal year 2000 routine waste generation amounts, and will reduce routine solid sanitary waste generation by 8%. Eighteen percent of solid sanitary waste will be recycled, transuranic waste generation will be reduced (compared to the fiscal year 1999 baseline), and the Laboratory will develop a transuranic waste minimization management plan.

Performance – The Laboratory earned an overall performance rating of Excellent from both the University of California and the Department of Energy. In the areas of low-level waste, mixed low-level waste, and hazardous waste generation, as well as reduction of solid sanitary waste generation, the Laboratory received a rating of Excellent, and for transuranic waste, a rating of Good.

Management Walkarounds

Ensuring that work meets safety expectations is a key management and employee responsibility and a core function of integrated safety management.

Target – Laboratory managers will perform safety oriented walkarounds, including focus on workers and observation of work activities.

Performance – The Laboratory earned an overall performance rating of Excellent based on completion rates of walkarounds and types of walkarounds performed.

Director's Safety Initiative

This is not a sprint we're in—it's a marathon with many challenges.

G. Pete Nanos, Jr.

The past year's safety performance measures were rated in the Good to Outstanding range, and the Laboratory made substantial progress, continuing a five-year trend of improvement.

However, challenges remain.

Continuous improvement in safety is the number one institutional goal. I want the best safety record in the world.

My focus is on increasing safety support for workers and improving working conditions. In our day-to-day operations, we will make further improvements in our safety culture and we will reinforce behaviors and attitudes that support safety.

I have renewed our commitment to excellence and found important issues we must now address.

- Laboratory managers must set the example and support the safe performance of work.
- We must increase support and ensure a no-fault system for prevention, diagnosis, treatment, and workstation improvement for repetitive motion injuries.
- We all experience the stress associated with change in the workplace, and managers can model behavior by supporting the safe performance of work.
- We must respond quickly to employees' safety concerns.
- We will involve workers in the creation of safety initiatives, such as hazard control plans. Managers must remediate facility hazards or shut down the facilities until improvements can be made.
- We realize that uniform and tailored application of our work-control processes can lead to increased worker safety as can increased attention to construction areas, traffic, parking, and walking.

In this stressful period after September 11, we are working very hard to support our country. We recognize that our nation demands nothing less of us.

G. Pete Nanos, Jr.
Interim Director of Los Alamos National Laboratory

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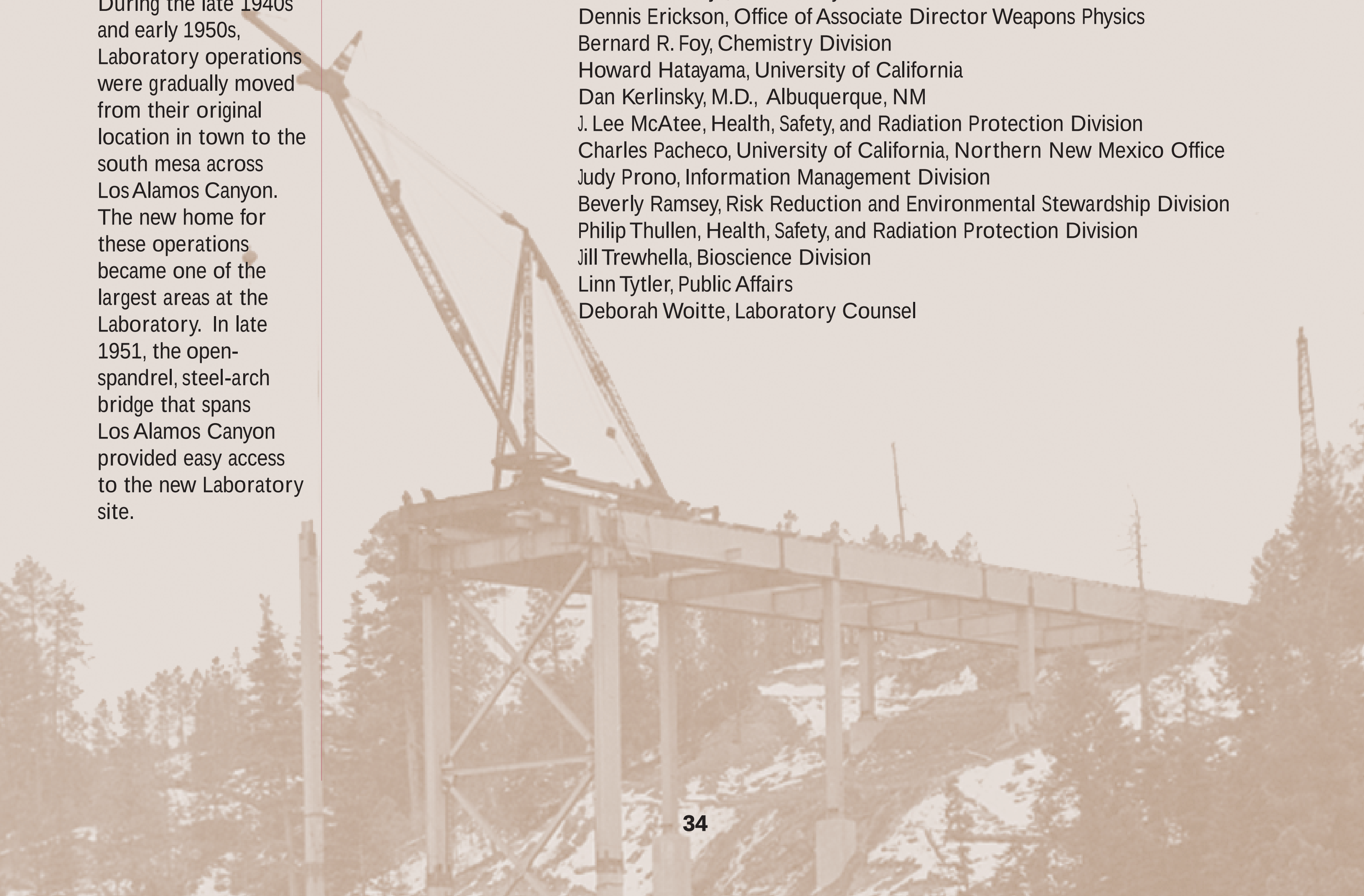

During the late 1940s and early 1950s, Laboratory operations were gradually moved from their original location in town to the south mesa across Los Alamos Canyon. The new home for these operations became one of the largest areas at the Laboratory. In late 1951, the open-spandrel, steel-arch bridge that spans Los Alamos Canyon provided easy access to the new Laboratory site.

Los Alamos National Laboratory was established in 1943 as Project Y of the Manhattan Engineering District. Under the leadership of J. Robert Oppenheimer, the Laboratory coordinated development of the world's first atomic bomb. Today, the Laboratory is a multidisciplinary, multiprogram laboratory whose central mission still revolves around national security.

Managed by the University of California for the U.S. Department of Energy, the Laboratory maintains a commitment to its tradition of free inquiry and debate, which is essential to any scientific undertaking. Located on the Pajarito Plateau about 35 miles northwest of Santa Fe, the capital of New Mexico, the Laboratory is one of 28 Department of Energy laboratories across the country.

The Laboratory covers approximately 40 square miles of mesas and canyons in northern New Mexico. As the largest institution and the largest employer in the area, the Laboratory has approximately 7000 University of California employees plus approximately 3400 contractor personnel. The annual budget is approximately $1.5 billion.

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